ER58

ELECTRICAL WORKERS REGISTRATION BOARD

SAFETY | COMPETENCY | COMPLIANCE

Candidate Code No.	
For Board Use Only	
Result	Result
Date	Date
Int	Int

ELECTRICIANS REGULATIONS EXAMINATION

22 November 2014

QUESTION AND ANSWER BOOKLET

Time Allowed: Three hours

INSTRUCTIONS – READ CAREFULLY

You have 10 minutes to read this paper but do not start writing until you are told to do so by the supervisor.

Write your Candidate Code Number in the box provided above. Your name must NOT appear anywhere in this paper.

Answer all questions.

The pass mark for this examination is 60 marks.

Use a pen for written answers. **Do not** use pencils or red pens.

Drawing instruments and pencils may be used when diagrams are required. Marks are allocated on the basis of correctness.

Do not use correcting fluid or correcting tape.

It is recommended that the reference source for your answers be included in the space provided if a question can be answered from the Act, Regulations, Standard or Code of Practice. However, just stating a reference only will earn no marks.

For calculation questions all workings, including formulae, must be shown to gain full marks.

Warning – You could get 0 marks for any question, or part of a question, if you show anything hazardous or dangerous in your answer.

You will need to use the following documents in this examination:

- Electricity Act 1992 reprint dated 1 January 2014
- Electricity (Safety) Regulations 2010 reprint dated 1 February 2014 or the reprint dated 1 August 2014
- AS/NZS 3000:2007 (incorporating amendments 1 and 2)
- AS/NZS 3001:2008 (incorporating amendment 1)

PLEASE HAND THIS PAPER TO THE SUPERVISOR BEFORE LEAVING THE ROOM

(turn over)

Question 1

(a) Refer to the Electricity Act 1992 and state the circumstances where an electrical installation can be connected to the electricity supply **before** being tested and certificated and inspected.

(2 marks)

Ref: ……………………………………………

(b) The Electrical Workers Registration Board can set a competence programme relating to practising licences.

Refer to the Electricity Act 1992 and state **TWO** persons for whom a **competence programme** can be set.

(2 marks)

(1)

(2)

Ref: ……………………………………………

(turn over)

Question 1 continued

(c) Refer to the Electricity (Safety) Regulations 2010 and state how a person providing line function services to a consumer must protect that consumer's installation against fault currents.

(2 marks)

Ref: ……………………………………

(d) Refer to the Electricity (Safety) Regulations 2010 and state **TWO** types of low voltage electrical installations that **must** comply with Part 2 of AS/NZS 3000.

(2 marks)

(1)

(2)

Ref: ……………………………………

(e) Refer to AS/NZS 3000 and state the requirements for the identification of a **common neutral** in a switchboard.

(2 marks)

Ref: ……………………………………

(turn over)

Question 1 continued

(f) Refer to AS/NZS 3000 and state **ONE** situation where live parts may be exposed on an **industrial switchboard**.

(2 marks)

Ref: ....

(g) Refer to AS/NZS 3000 and state the circumstances in which a main switchboard **can be installed:**

(i) Near a swimming pool.

(1 mark)

Ref: ....

(ii) Near an automatic fire sprinkler.

(1 mark)

Ref: ....

(turn over)

Question 1 continued

(h) Refer to AS/NZS 3000 and state **TWO** circumstances in which low voltage cables can be installed in the same wiring system as extra-low voltage cables.

(2 marks)

(1) ______________________________

(2) ______________________________

Ref: ……………………………………

(i) A two-core neutral-screen cable had been buried direct (unenclosed) in an unpaved area between two buildings.

Refer to AS/NZS 3000 and state the **TWO** requirements for indicating the position of the buried cable **after it has been installed**.

(2 marks)

(1) ______________________________

(2) ______________________________

Ref: ………………………………………

(turn over)

Question 1 continued

(j) A low voltage MEN electrical installation must have a main earthing conductor.

Refer to AS/NZS 3000 and state where the ends of a main earthing conductor must be connected.

(2 marks)

Ref: ………………………………………

(turn over)

Question 2

The Electricity (Safety) Regulations 2010 permits a person who issues a certificate of compliance for work in a caravan (connectable installation) to also issue a warrant of electrical fitness for that caravan (connectable installation).

(a) You are required to install a new final subcircuit to two new socket outlets in a caravan.

(i) Refer to AS/NZS 3001 and state the **TWO** documents that detail the installation and testing requirements for the new final subcircuit and two new socket outlets.

(1 mark)

____

____

Ref: …………………………………..

(ii) Refer to the Electricity (Safety) Regulations 2010 and state the document that must be issued for the new final subcircuit and two new socket outlets.

(1 mark)

____

Ref: …………………………………..

(b) You are required to re-issue a warrant of electrical fitness for the caravan.

(i) Refer to AS/NZS 3001 and state the minimum permitted length of the caravan supply lead

(1 mark)

____

Ref: …………………………………..

(turn over)

Question 2 continued

(ii) Refer to AS/NZS 3001 and state how the earth continuity of the new and existing socket outlets in the caravan are to be verified.

(2 marks)

Ref: …………………………………..

(iii) Refer to AS/NZS 3001 and state the requirements relating to the **supply lead plug**.

(3 marks)

Ref: …………………………………..

(turn over)

Question 2 continued

(iv) Refer to the Electricity (Safety) Regulations 2010 and state the requirements for issuing a warrant of electrical fitness.

(2 marks)

(1) ______________________________

____

____

(2) ______________________________

____

____

(3) ______________________________

____

____

(4) ______________________________

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Ref: ……………………………………..

(turn over)

Question 3

You are wiring a new domestic residence that includes standard lighting, recessed luminaires and other permanently connected equipment.

(a) Lamp holders must be **located** to protect against inadvertent contact with live parts.

Refer to AS/NZS 3000 and state those **TWO** installation methods that can be used to protect against inadvertent contact with live parts.

(2 marks)

(1) ____

(2) ____

Ref: ……………………………………………

(b) Refer to AS/NZS 3000 and state the connection requirement for the neutral conductor in an Edison screw lampholder.

(1 mark)

____

Ref: ……………………………………………

(turn over)

Question 3 continued

(c) Recessed luminaires have been installed in the lounge and kitchen of the domestic residence.

(i) Recessed luminaires and auxiliary equipment must be installed to prevent two situations occurring. Refer to AS/NZS 3000 and those **TWO** situations.

(2 marks)

(1) ____

(2) ____

Ref: ....

(ii) Refer to AS/NZS 3000 and state a method of preventing one of the situations stated in (c)(i) occurring.

(2 marks)

Ref: ....

(turn over)

Question 3 continued

(d) Refer to AS/NZS 3000 and state **THREE** requirements for the equipment wiring.

(3 marks)

(1) ______________________________

(2) ______________________________

(3) ______________________________

Ref: ……………………………………..

(turn over)

Question 4

(a) Referring to AS/NZS 3000 and describe the **THREE** types of underground wiring systems.

(3 marks)

(1) ____

(2) ____

(3) ____

Ref: ……………………………………..

(turn over)

Question 4 continued

(b) You are installing a $4mm^2$ twin and earth TPS cable underground between two buildings. The ground between the buildings is stone-free topsoil to a depth of 1 metre. There are no concrete paths or drives over the cable route.

(i) From (a) select the correct underground wiring system for the $4mm^2$ twin and earth TPS cable underground.

Draw and label a cross section of the cable in the cable trench. Include any other materials required. All dimensions from ground level are to be shown.

(4 marks)

Ground level

____

Ref: ………………………………………..

(turn over)

Question 4 continued

(c) Refer to AS/NZS 3000 and state the **FOUR** situations where aerial conductors are required to be insulated.

(2 marks)

(1) ____

(2) ____

(3) ____

(4) ____

Ref: ………………………………….

(d) Refer to AS/NZS 3000 and state the cable type and minimum size requirements for an aluminium aerial conductor.

(1 mark)

____

Ref: ………………………………….

(turn over)

Question 5

Automatic disconnection of supply is a permitted method of fault protection (protection against indirect contact) and overcurrent protection (to prevent injury or damage).

(a) Refer to AS/NZS 3000 and state the **TWO** characteristics required for short-circuit protective devices.

(2 marks)

(1) ____

(2) ____

Ref: ....

(turn over)

Question 5 continued

(b) Refer to AS/NZS 3000 and state **TWO** circumstances where an overload protective device may be omitted.

(2 marks)

(1) ____

(2) ____

Ref: ....

(c) Refer to AS/NZS 3000 and state **TWO** types of fittings that are suitable for protection against both overload and short circuit currents.

(2 marks)

(1) ____

(2) ____

Ref: ....

(turn over)

Question 5 continued

(d) Refer to AS/NZS 3000 and state **TWO** types of protective devices (fittings) that can be used to provide the automatic disconnection of the supply.

(2 marks)

(1) ______________________________

(2) ______________________________

Ref: ……………………………………

(e) An air compressor motor circuit is protected by fuses labelled gM at a switchboard. Describe the main characteristic of a fuse labelled gM that distinguishes it from a fuse labelled gG.

(2 marks)

(turn over)

Question 6

(a) State the Standard and section of that Standard that details the testing and inspection requirements for prescribed electrical work carried out on a low voltage electrical installation.

(1 mark)

Ref: ……………………………………

(b) A registered electrician has completed wiring a **new** three-phase, low voltage, electrical installation in a commercial development. The wiring complies with Part 2 of AS/NZS 3000.

(i) Refer to the Electricity (Safety) Regulations 2010 and state which document is required to be issued for the general prescribed electrical work carried out in the commercial development?

(1 mark)

Ref: ……………………………………

(ii) Refer to the Electricity (Safety) Regulations 2010 and state who is required to issue the document stated in (b)(i)?

(1 mark)

Ref: ……………………………………

(iii) Refer to the Electricity (Safety) Regulations 2010 and explain why **mains work** is required to be inspected.

(2 marks)

Ref: ……………………………………

(turn over)

Question 6 continued

(iv) The **mains work** carried out in the commercial development is required to be inspected. Refer to the Electricity (Safety) Regulations 2010 and define the term **mains work**.

(3 marks)

Ref: ....

(v) Refer to the Electricity (Safety) Regulations 2010 and state which document must be issued after all testing, inspection and certification has been completed.

(1 mark)

Ref: ....

(vi) To whom does the document stated in (v) have to be given?

(1 mark)

Ref: ....

(turn over)

Question 7

You are wiring a small **single-phase** **boarding house** and need to determine the size of the mains.

The loads stated are for the input power.

Number	**Equipment**
15	40W Fluorescent fittings
35	8W, LED recessed lights
15	10A single socket outlets
5	15A single socket outlets
1	2kW food chiller cabinet
1	3 kW clothes dryer
1	6 kW gas/electric range

Refer to AS/NZS 3000 and calculate maximum demand of the installation in amps. Use the table on the following page for your calculations.

(10 marks)

(turn over)

Question 7 continued

Equipment	**Load Group**	**Calculation**	**Load (A)**
Total			

Ref: ………………………………………

(turn over)

Question 8

Electrical installations shall be provided with devices for isolation and switching to prevent or remove hazards associated with the electrical installation and for the maintenance of electrical equipment.

(a) A main switch or switches is required to be installed on a main switchboard for the control of an electrical installation.

Refer to AS/NZS 3000 and state **THREE** types of fittings that **need not be** controlled by a main switch.

(3 marks)

(1) ______________________________

(2) ______________________________

(3) ______________________________

Ref: ………………………………………

(turn over)

Question 8 continued

(b) There are two points of supply to a building. Each point of supply is controlled by a main switch.

Refer to AS/NZS 3000 and state **ONE** identification requirement for the main switches.

(2 marks)

Ref: ……………………………………

(c) Refer to AS/NZS 3000 and state the reason why **functional switching** is used.

(2 marks)

Ref: ……………………………………

(turn over)

Question 8 continued

(d) Refer to AS/NZS 3000 and state **TWO** circumstances where the switching of a neutral conductor is prohibited.

(2 marks)

(1) ____

(2) ____

Ref: ……………………………………

(e) Refer to AS/NZS 3000 and state **ONE** requirement for a main switch that is able to be controlled remotely.

(1 mark)

Ref: ………………………….

turn over)

Question 9

Introduction

A new final subcircuit is to supply two new Class I navigation lights on a marina for the guidance of vessels to the marina jetty.

The new final subcircuit is supplied from a switchboard in the shore based management office.

- The voltage at the switchboard is 230V.
- The final subcircuit is a 2.5 mm^2 Cu, 2 core neutral screen cable. The cable cores and screen are all 2.5 mm^2.
- The route length from the switchboard to the first light is 100 metres
- The route length between the first light and the second light is 20 metres
- The resistance of **EACH** core, including the cable screen is 7.41 Ω / kM
- The **SINGLE PHASE** mV / A.m = 18.9
- Each light is 100 watts
- A type gG HRC fuse will be used for the protection of the final subcircuit.

All the information required to answer this question is in the introduction.

Use the information in the introduction to this question to answer parts 9(a), 9(b) and 9(c).

(a) Refer to AS/NZS 3000, and state the maximum disconnection time permitted for gG HRC fuse if an earth fault of negligible impedance occurs in the second luminaire. Give a reference to support your answer.
(1 mark)

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____

Ref: …………………………………..

(turn over)

Question 9 continued

(b) (i) Calculate the voltage drop at the **first** light when both lights are operating.

(4 marks)

(ii) Calculate the voltage drop at the **second** light when both lights are operating.

(2 marks)

Question 9 continued

(c) (i) Calculate the resistance of the phase and earth (screen) conductors of the 2.5 mm^2 Cu, 2 core neutral screen cable final subcircuit between the switchboard and the second light.

(2 marks)

(ii) Refer to section 8 of AS/NZS 3000 and determine the **maximum** rating of the gG HRC fuse that can be installed on the switchboard to protect the 2.5 mm^2 Cu, 2 core neutral screen cable, final subcircuit.

(1 mark)

Ref: ………………………………………..

For Candidate's Use

In the box, write the number of **EXTRA** sheets you have used. Write **NIL** if you have not used any

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Questions Answered	**Marks**	
1		
2		
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TOTAL		